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Birds of a Feather Succeed Together? Racial Residential Segregation and Educational Attainment

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ABSTRACT

Is racial residential segregation or integration a stronger predictor of educational attainment? Does the racialized direction of this relationship matter? Drawing from Wilson's (1987) social isolation theory and Massey and Denton's (1993) theory of racial segregation and poor neighborhood formation, I propose that 1) greater residential racial homogeneity and 2) greater white residential segregation will increase average educational attainment at the county level. I analyze data from the 2016 County Health Rankings and Roadmaps along with the 5-year 2011-2015 American Community Survey, both of which yield a total population size of 3,141 counties. The study reveals that the impact of residential segregation on academic achievement is indeed racialized: white residential segregation most strongly affects county percent high school graduation. General residential segregation, however, is positively and significantly related to high school *and* graduate/PhD degree level completion. Nevertheless, median household income and county rurality are consistently the *strongest* predictors of high school and graduate/PhD completion across four regression models. While these results confirm both hypotheses, they highlight the strength of alternative explanations for educational gaps in the United States—gaps that may be more directly tied to social capital and rurality. The findings suggest that policies intending to alleviate disparities in educational attainment cannot center segregation alone, they must also offer a broader solution to social isolation and resource deprivation patterns by targeting counties with lower median household incomes and greater rurality.

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The observed and unknown consequences of living in segregated neighborhoods have encouraged further inquiry in this particular area. Some sociologists have examined this correlation by studying the relationship between racial composition and educational attainment, especially as the two relate to locational residence and spatial arrangement (Swisher, Kuhl, and Chavez 2013). Of these ongoing findings, Johnson and Shapiro (2003) conducted a qualitative study, which revealed the significant influence of neighborhood and school choices on the reproduction of racial segregation and inequity in education. Studying the links between these social factors and conditional outcomes has broadened the scope of research concerning race and racial inequality by providing social scientists with new terminology and concepts to consider, such as "neighborhood effects" and their associated consequences for social groups and their paths to educational success. These new considerations have offered insightful explanations for the hierarchical structure of the education system in the United States, and they have highlighted the historical and contemporary outcomes of racial segregation in neighborhoods and schools.

In terms of school enrollment, educational options for aspiring students in the United States are abundant. Most students attend public schools, which tend to be linked closely with residential location as they draw funding from public taxpayers living within outlined school districts (Shapiro and Johnson 2000). By association, neighborhood districts (or counties) provide the financial means for public schools to improve education quality and therefore their students' odds at higher educational attainment. Related factors such as residential stability, community integration and community resources are also identified as key influencers of achievement levels (Karen 2005). Despite these identified links between residency and success

in education, studies have also revealed that these links are not equally applicable to all residents of the United States (Goldsmith 2009; Owens 2010; Quillian 2014; Shapiro and Johnson 2000).

Historically, people of color, especially those racialized as "black," have been isolated in pre-determined residential areas. Their housing "assignments" were linked to social phenomena, of which "redlining," public housing projects and "white flight" were major determinants (Pearcy 2015). These historical conditions have made black youth, and other youth of color, less likely to come from wealthy families or to grow up in wealthy neighborhoods (Vartanian and Gleason 1999). Therefore, on micro, meso and macro levels, sociologists have linked these phenomena, directly or indirectly, to the maintenance of racial segregation, racial gaps in education and racial inequality more generally in the United States (Owens 2010; Qullian 2014; Wodtke, Harding, and Elwert 2011). Given these recognized connections, scholars have expanded upon previous findings to further unpack inequity in education as it relates to pre-existing conditions of racial inequality (Charles 2003; Massey 1990; Roscigno 1998). Their studies raise subsequent questions about which social conditions best account for access to and success in higher education and the extent to which residential integration can improve racial educational outcomes. Continued research in this area can help sociologists place the factors most significantly impacting racial gaps in educational attainment within ongoing theoretical discussions to reevaluate solutions for narrowing and eliminating these disparities.

This study assesses spatial and racial patterns in educational outcomes. Building upon previous studies that link neighborhood effects to educational attainment, my research seeks to unpack the question: is racial residential segregation or racial residential integration at the county level a stronger predictor of educational attainment? Subsequently, I question if the racialized direction of the segregation impacts the degree of educational attainment. Furthermore, this study

controls for the effects of income, age, and rurality on county-level educational outcomes. I hypothesize that the more racially homogenous the county, the higher the average level of education achieved. Moreover, I predict that as the county percent of white residents increases, the average educational attainment will also increase.

SEGREGATION AS SOCIAL ISOLATION

The relationship between residential segregation and educational attainment remains complex, and this research relies on both theoretical and practical rationale to explain its multi-dimensionality. Within the broad study of neighborhood effects and their impacts on educational achievement patterns, sociological research draws from Wilson's (1987) social isolation theory, Massey and Denton's (1993) theory of racial segregation and poor neighborhood formation and their shared, broader associations with key terms like "concentrated disadvantage" to explain this relationship (Owens 2010; Quillian 2012; Vartanian and Gleanson 1999).

In his theory of social isolation, Wilson (1987) argues that living in "socially isolated neighborhoods will have a negative effect on educational attainment" (Vartanian and Gleason 1999:22). Expanding upon Wilson's theory, sociologists have associated multiple dimensions of social isolation—including geographic isolation, cultural isolation, and socioeconomic isolation (especially impoverished neighborhoods)—to explanations of its inverse effect on educational attainment (Brooks-Gunn et al. 1993; Duncan 1994; Wodke et al. 2011). Social isolation has been defined by some as the structural, and oftentimes social, distance from "social networks and institutions that provide access to job information and important links to mainstream culture" (Wodke et al. 2011:715). As this distance from valuable resources increases, residents in "isolation" become further removed from the means most ideal for improving their cultural and

social capital. Thus, the isolation of already disadvantaged residential communities further deprives them of access to the means for educational and social mobility.

In line with resource theories of neighborhood effects, socially isolated neighborhoods tend to lack institutional resources such as "quality schools, daycare centers, grocery stores, pharmacies, and recreational areas that promote child development and academic achievement" (Wodke et al. 2011:717). A lack of such resources contributes to the socialization and decelerated academic performance of these neighborhood residents because they isolate residents from mainstream cultural values and opportunities and force aspiring students to juggle more priorities and constraints than students from more privileged neighborhoods, where public services are more regularly maintained and accessible (Crowder and South 2011; Charles et al. 2009). Scholars have therefore demonstrated a strong correlation between social isolation and resource deprivation (Owens 2010; Vartanian and Gleason 1999; Wodke et al. 2011).

When neighborhoods are isolated in poverty, social isolation theorists also argue that there is a greater lack of positive adult role models because impoverished neighborhoods tend to have higher rates of unemployment and a smaller number of residents who hold professional or managerial positions (Brooks-Gunn 1993). In other words, impoverished social isolation influences "collective socialization processes" by exposing youth to particular role models, who tend to be less conducive to fostering success and motivation in school (Ainsworth 2002:119).

Regardless of its merit, Wilson's theory of social isolation is challenged by Massey and Denton (1993), who claim that it overlooks the interactive effects of persistent racial segregation on concentrations of poverty. Whereas social isolation theory emphasizes the benefits of higher quality neighborhoods (as defined by neighborhood wealth) and the consequences of concentrated poverty, Massey and Denton's theory of racial segregation and poor neighborhood

formation complicates Wilson's theory by adding the conditioning factor of racial segregation (Quillian 2012). Evidently, racial segregation may moderate the strength and direction of social isolation impacts because it leaves communities of color in less likely positions to take advantage of "classed" resources and opportunities, many of which translate into educational achievement and advancement (Quillian 2012). Both the overlap and discord between these two theories guide the current study at hand, which assesses how racial residential segregation may interact with socioeconomic privileges to produce indicative educational success patterns. To assess other dimensions of social isolation, I control for age, median household income and rurality. Meanwhile, I hypothesize that the greater the racial residential segregation, the higher the average educational attainment. To test Massey and Denton's (1993) theoretical framework, I also predict that the whiter the county, the higher the average educational attainment.

REVIEW OF THE LITERATURE

As previously mentioned, residential segregation tends to reinforce existing social inequalities by creating "concentrated [geographic] areas of advantage and disadvantage" (Condron et al. 2013:131). To date, the most extensive literature emphasizing the effects of residential segregation is situated within a theoretical discussion of "neighborhood effects," which identify distinct neighborhood characteristics and their associated life outcomes. These effects have immediate and tangible implications for policymakers, who are challenged to address the issue of educational inequality while considering the *combined* impact of student and family background, school effectiveness and neighborhood context (Garner and Raudenbush 1991) Meanwhile, an important but neglected aspect of the study of neighborhood effects is the intersection of its multiple facets. Even though scholars typically discern between distinct forms of neighborhood effects—including those that are spatial, racial or socioeconomic—these differences are often

complicated and interrelated. To assess the impact of residential segregation on educational attainment, I frame my study within this larger discussion of neighborhood effects.

Spatial Neighborhood Effects

Prior research has emphasized that educational outcomes should be understood in terms of social structures of inequality rather than individual cases. Therefore, an examination of structure lends itself well to the broad study of spatial arrangements and their related neighborhood effects. Indeed, the dynamics of educational stratification are often "manifested at more local levels but tend to be mediated through proximate institutions and structures" (Roscigno, Tomaskovic-Devey, and Crowley 2006:2139). In other words, spatial and structural arrangements are significant to the study of neighborhood effects because they constitute the "larger social contexts wherein individuals move through…to positions of different rewards and privilege" (Karen 2005:167). These arrangements often favor advantaged social groups but exacerbate the problems of those already experiencing disadvantage (Gordon and Monastirotis 2006). As such, communities suffering decades of "structural neglect" tend to demonstrate the negative, cumulative impacts of living in disadvantaged neighborhoods (Wodtke et al. 2011).

By and large, structural disadvantages embedded in neighborhoods affect educational outcomes, and these dynamics can be facilitated by geographic location and regional differences. For instance, Roscigno et al. (2006:2139) found that families in America's inner cities and rural areas were more likely to lack the necessary resources that promote educational achievement because families in these geographical locales tend to have "lower family income, less parental education and more siblings per household." Studies such as these reveal the need to control for type of residence in analyses of residential segregation because urban and rural scales can significantly influence the degree of neighborhood effects on educational outcomes (Gordon and

Monastirotis 2006). Likewise, institutionalized residential segregation along any lines of distinction creates pockets of similarity *or* dissimilarity where collective and primary or secondary socialization processes shift community prioritizations of educational attainment. Berg et al. (2013:528) claimed that in neighborhoods with greater cultural heterogeneity, students were "less likely to enroll in college" and even those who aspired to attend would have "lower probabilities of enrollment." My current study draws from these previous findings to assess the impact of residential homogeneity versus heterogeneity on educational achievement.

Along with structural impact, sociologists have examined spatial arrangements as they relate to the inequalities of place (Berg et al. 2013; Lee et al. 2008; Roscigno et al. 2006). For example, Crowder and South (2011) discussed the importance of spatial relativity in determining educational outcomes, revealing how extralocal dynamics between and beyond neighborhoods can sometimes have greater impacts on life outcomes than the local dynamics within neighborhoods. Hence, social context dynamics can be characterized by two different geographic scales of location and interaction (Gordon and Monastirotis 2006). To this end, Crowder and South (2011:18) revealed that existing "levels of socioeconomic advantage of immediate neighboring residencies were positively associated with the likelihood of graduating from high school." Since most scholars studying neighborhood effects and educational outcomes tend to analyze the dynamics *of* neighborhoods rather than *among* them, these studies may overlook the multiple scales of residency that impact educational attainment.

Beyond the aforementioned effects of neighborhood characteristics, Lee et al. (2008) further encouraged scholars to conceptualize residential segregation on numerous geographic scales because the degree of the impact of residential segregation shifts along different units of analysis. For many scholars, census tracts are the default unit of analysis for residential

segregation; however, treating tracts as a "gold standard" when measuring segregation ignores variation within "territorial domains larger or smaller than tracts" (Lee et al. 2008:769). Although this current study defers to the typical unit of analysis, it is guided by these prior suggestions to consider how constraining investigations of residential segregation to one scale may overlook or underestimate the variation of neighborhood effects. As one might expect, spatial segregation both defines and is defined by other forms of segregation.

Racial Neighborhood Effects

Along with spatial characteristics, multiple studies have analyzed the consequences of racialized neighborhood effects on one's quality of life, including one's academic achievement (Charles 2003; Emerson, Chai, and Yancy 2001; Shapiro and Johnson 2000). Given the historical and sustained presence of racial segregation throughout the United States, school composition has also remained largely segregated (Renzulli and Evans 2005; Rivkin 1994; Shapiro and Johnson 2000). As such, racial opportunities continue to be structured by spatial and racial arrangements (Roscigno 1998). While this study focuses on the underlying effects of *residential* segregation, it is hard to ignore that racial segregation manifests itself in multiple institutionalized spaces.

For example, Condron et al. (2013) used an index of dissimilarity and found that as black-white dissimilarity increased in schools, the black-white achievement gap also widened in favor of white students' educational advancement. Their findings fit into the broader theoretical proposition that "segregation has negative consequences for [racial] minorities" (Condron et al. 2013:150). Likewise, attending a predominantly black segregated school "continues to have a negative influence on achievement" while the opposite is true in predominantly white schools (Roscigno 1998:1051). Given that the same patterns may be true for counties, my intended research project will use a similar index of dissimilarity to reveal whether increases in white

people-people of color dissimilarity at the county level results in racially indicative educational achievement patterns.

Duncan (1994) also added that the significance of neighborhood racial composition is directional: it matters negatively for black residents but not white residents. When controlling for gender, his results yielded that black respondents completed fewer years of school in neighborhoods with a greater concentration of black residents. These direct ties between racial segregation and educational performance commonly spill over from residential districts to school settings as a result of district fragmentation (Bischoff 2008). Furthermore, Emerson et al. (2001) studied how racial residential segregation tends to be maintained unidirectionally by white residents. This residential segregation thus becomes further racialized in that residency changes tend to *center* whiteness. For instance, Emerson et al. (2001:923) described two racially telling processes: people of color are gaining the freedom to "move into predominantly white neighborhoods and when they have the means to do so, they do" while white people *have* had the freedom to switch residencies and "they…move away from…populations [of color]." The politics of choice appear to be inseparable from racialized residential patterns, yet they are also complicated by the differential degrees of freedom racial groups possess to afford residential moves. To expand upon these findings, I am interested in examining the impact of ongoing white segregation on the academic achievement gaps between white people and people of color.

Socioeconomic Neighborhood Effects

On the other hand, race and socioeconomic status are two concepts often left intertwined by historical, institutional policies. Not surprisingly, the two are difficult to differentiate when seeking to understand the root factor, or factors, influencing "neighborhood effects." After decades of residential segregation and social isolation, "neighborhood economic conditions are

strongly defined along racial lines" (Johnston 2017:336). In consideration of these interconnections and the theories of social isolation and residential segregation guiding this study, Turley (2003) suggested that neighborhood racial composition *conditions* the impact of neighborhood social class status, which may be a stronger predictor of educational attainment.

Like Turley, many sociologists insist that residential segregation reinforces inequality in educational outcomes because it stems from concentrated regional wealth or poverty, both of which are attached to differential levels of social prestige and social capital (Mayer 2002; Wagmiller et al. 2006). Ainsworth (2002) found that neighborhood context can influence educational outcomes among residents depending on the existing amount and quality of social capital in the community. Neighborhoods with more "high-status" residents and families (in terms of income, education and occupational prestige) tend toward enhanced educational outcomes (Ainsworth 2002; Duncan 1994; Owens 2010).

Statuses such as these afford families greater access to school programs equipped with professionally trained faculty and staff, advanced technologies and career-oriented assets to facilitate student progression through multiple degrees of education, like private tutors and career coaches. These neighborhoods may also influence "selection into academic tracks or friend groups" as they create circles of convenience or association between families with similar socioeconomic backgrounds and comparable means to access higher education (Owens 2010:307). Social isolation theorists offer further explanations for these "classed" patterns as they reveal how residents from poor neighborhoods are less likely to have access to these means of cultural and social capital; therefore, neighborhoods that are marked by a lack of socioeconomic privilege possess fewer opportunities to profit from tools intended for higher education navigation and success (Wodtke et al. 2011).

While some neighborhood effects are more socially driven, economic segregation also aggravates differences in educational attainment, especially between high- and low-income students (Mayor 2002; Johnston 2017). In her study, Mayor (2002:167) highlighted how the potential benefits of economic segregation on educational attainment and well-being could further aggravate residential segregation because the "rich are likely to segregate [more] as they get richer." Along with their physical concentration of socioeconomic privileges, wealthier families also enjoy the liberty of school choice regardless of neighborhood location or racial composition. When possessing the financial ability to choose schools, people often switch residencies or send their children to schools outside of their districts in the hopes of increasing their rates of educational success (Renzulli and Evans 2005; Saporito and Sohoni 2007).

With their ability to choose the type of educational institution for their children to attend, wealthier families are no longer obligated to attend public schools, which are historically linked to neighborhood districts and therefore more subject to "neighborhood effects" (Roscigno 1998:1051). Even without transferring their students to districts outside of their residential ones, wealthier families also possess the means to afford an *initial* choice of residency based on "classed" expectations, including the "quality of public goods," the "goodness" and safeness of a neighborhood and its "demographic composition" (Bischoff 2008:186; Johnson and Shapiro 2003). Coinciding with these choices and expectations, increases in neighborhood socioeconomic advantage have been strongly tied to both high school graduation rates and total years of schooling (Johnston 2017; Owens 2010; Vartanian and Gleason 1999). Patterns such as these have the potential to become cyclical, self-fulfilling prophecies in academic achievement, thereby reproducing and further exacerbating class differences.

Other studies affirm this possibility, providing evidence that in more economically segregated areas, high school graduation rates are lower among students with disadvantaged backgrounds because residential segregation along "disparate economic circumstances" creates the "structural context that fuels skill gaps" between students (Condron et al. 2013:150; Quillian 2014:421). Moreover, growing up in a "good" neighborhood (defined by the presence of wealthy residents) tends to have a positive effect on educational attainment, signaling that socioeconomic neighborhood effects are strong predictors of achievement in school (Vartanian and Gleason 1999:24). For school options that are not publicly-funded, this effect is even more logical given that the expenses of private institutions (i.e. tuition, room and board and transportation fees) limit access for many social groups to these opportunistic educational spaces.

Within the broader theoretical conversation of neighborhood effects, sociologists remain divided on the subject of *which* neighborhood effects are the strongest predictors of skill gaps and differences in educational attainment. Most researchers, including myself, study the outcomes of neighborhood effects through one of these three explanatory frameworks; however, my research has been informed by these findings to consider the intersectionality of neighborhood effects. While my results may more explicitly support one explanation, there is no doubt that all three explanations are mutually linked and reinforcing of one another.

METHODS

Data

This project used data from two sources: the 2016 County Health Rankings and Roadmaps (CHRR) of the University of Wisconsin Population Health Institute and Robert Wood Johnson Foundation as well as a cumulative 5-year (2011-2015) data set from the American Community Survey (ACS) of the United States Census Bureau. Both data sets were compiled at the county

level, encompassing measures from all counties in the United States. Overall, these data sets yielded a total population size of 3,141 counties on the variable measures. The former drew from public, nationally representative archives, some of which included the U.S. Census Bureau Population Estimates Program (PEP response rate = 94.7 percent), U.S. Census Bureau Small Area Income and Poverty Estimates (SAIPE 2015 one-year estimates), and the American Community Survey, which encompasses a vintage of estimates that culminates data from all years since the most recent decennial census (UWPHI 2017). The latter reported a 95.4 percent response rate for the 2011-2015 cumulative data set (USCB 2017). Because both amassed data from multiple sources, they involved a variety of data collection methods, including county-level aggregations of questionnaire surveys and public, national archival data. In this study, I conducted secondary analyses of these data sets. For further information on how the data were collected, see http://www.countyhealthrankings. org/ranking-methods/data-sources-and-measures and https://www.census.gov/programs-surveys/acs/methodology.html.

Variables

The main independent variable of interest was residential segregation, and the 2016 CHRR data set operationalized it using a residential dissimilarity index, which distinguished between white residents and residents of color (drawn from the 5-year 2015 ACS). This index measured the evenness of the distribution of two groups (in this case, residents of color and white residents) across the census tracts in each county. As such, residential segregation was scored from 1 to 100 (1 indicating complete racial integration and 100 indicating complete racial segregation). A county's final "score" represented the percentage of white people or people of color who would hypothetically have to move to a different census tract to produce a distribution of the racial composition that matched that of the larger county (UWPHI 2017).

Unfortunately, this residential segregation measure was only available for counties with a population size of at least 100 residents of color. After excluding the 361 county cases with missing data on the index measure, the subset sample population size was $n = 2{,}780$ counties. Furthermore, I created a second data set to assess *white* residential segregation using the percentage of non-Hispanic white residents per county (drawn from the PEP), with values from 0 to 100 percent ($n = 3{,}140$ counties). On all other variable measures, the number of missing cases was less than 5 percent of the total sample population; therefore, choosing not to exclude them had no significant effect on the findings.

Educational attainment variables were drawn from the 5-year 2015 ACS, and they measured traditional completion points of education in the United States: high school diploma or GED, associate's degree, bachelor's degree and graduate or professional (PhD) degree. The 5-year ACS (USCB 2017) survey asked, "what is the highest degree or level of school this person has COMPLETED?" and then calculated the percentage of the members within a county completing *each* degree and *only* that degree rather than cumulative degrees. The four levels were treated as separate variables and were measured from 0 to 100 percent.

Control variables were examined for their potential and alternative neighborhood effect explanations for consequent disparities in educational attainment. Median household income was considered to account for the effects of social class and social capital, previously identified forms of socioeconomic neighborhood effects that influence educational outcomes. The 2016 CHRR calculated the median household income per county, with approximately $22,000 as a lower limit and $125,000 as an upper limit. Defined as "total income," the CHRR variable was drawn from the SAIPE and measured the sum of the amounts reported separately for wage or salary income, net self-employment income, interest, dividends, Social Security income, welfare

payments, and retirement/survivor/disability pensions (UWPHI 2017). Median age per county was drawn from the 5-year 2015 ACS, aided in identifying counties with extremely young or old residents and ranged from 21 to 65 years. Finally, county percent rural assisted in measuring the impact of spatial neighborhood effects as it measured the percentage (0 to 100 percent) of each respective county population living in a rural area (drawn from the PEP).

FINDINGS

Table 1 reports the means, medians and standard deviations of all variables. Although this study assessed its research questions with two data sets for each of its primary independent variables, the univariate analysis was condensed into a single table for ease of comparison.

TABLE 1 ABOUT HERE

According to Table 1, the mean for the independent variable "Racial Residential Segregation" was an index score of 31. The standard deviation was 13, which indicates that 68 percent of U.S. counties scored between 18 and 44 on the residential segregation index of dissimilarity. This range of scores tended toward the overall side of "integration" on the index. In Figure 1, the frequency distribution of this variable skewed slightly to the right, revealing that a majority of the segregation index scores fell between 1 and 39.

FIGURE 1 ABOUT HERE

Table 1 also showed that the mean of the "Percent White" variable was 77 percent, highlighting that on average, American counties are composed of more than three-fourths white residents. The standard deviation for this variable was 20, revealing that 68 percent of all counties in the United States are composed of between 57 and 97 percent white residents. In Figure 2, the frequency distribution of this measure skewed to the left, indicating that most counties in the United States are more than 50 percent white.

FIGURE 2 ABOUT HERE

When comparing the means and standard deviations of the degrees of educational attainment in Figure 3, county percent high school graduation was the highest on average at 35 percent, with a standard deviation of 7. Average county percentages of completed associate's and graduate or professional degrees were the lowest, at 8 percent and 7 percent, respectively. Figure 4 revealed that the frequency distribution of county percent high school graduation skewed slightly to the left, indicating that a greater percentage of counties completed *only* high school. By contrast, the other three visualizations of educational attainment (see Figures 5-7) skewed slightly to the right, so county-level completion of post-secondary education was rarer overall.

FIGURE 3 ABOUT HERE

FIGURE 4 ABOUT HERE

FIGURE 5 ABOUT HERE

FIGURE 6 ABOUT HERE

FIGURE 7 ABOUT HERE

Of the study's control variables, the mean age of U.S. counties was 41 (standard deviation = 5). In Figure 8, the frequency distribution was slightly skewed to the right, indicating that a greater portion of county median ages fell on the younger end of the 21-65 range.

FIGURE 8 ABOUT HERE

The average median household income in the counties was $47,175.00 (standard deviation = $12,413.00) and the frequency distribution (see Figure 9) was heavily skewed to the right, with more median household income levels falling between $30,000 and $79,999.

FIGURE 9 ABOUT HERE

On average, the data revealed that 54 percent of county residents live in rural areas, with a standard deviation of 30. Figure 10 highlighted that the frequency distribution of this variable was not particularly skewed in either direction.

FIGURE 10 ABOUT HERE

At the bivariate level, all statistically significant correlations between two given variables were significant at the $p < .001$ level. The results showed weak to moderate relationships between residential segregation and educational attainment (see Tables 2 and 3). Between racial segregation and postsecondary higher education measures (see Table 2), the correlation coefficients were all positive, indicating that increases in racial segregation index scores were linked to increases in educational attainment percent levels at the associate's ($r = .105$***), bachelor's ($r = .090$***) and graduate/PhD ($r = .137$***) degree levels. In Table 3, county percentages of white residents were positively and moderately correlated with educational achievement levels at the high school graduation and associate's degree levels. As the percentage of white residents per county increased, so too did county percentages of high school graduation ($r = .321$***) and associate's degree completion ($r = .338$***).

TABLE 2 ABOUT HERE

TABLE 3 ABOUT HERE

County median age was the variable correlated with the least number of variables. Across Tables 2 and 3, median age was weakly and positively related to county percent earning associate's degrees ($r = .102$*** and $r = .105$***, respectively). As the median age per county increased, so too did the county percent earning associate's degrees.

Median household income at the county level was also weakly to strongly correlated with educational attainment in Tables 2 and 3. Between high school graduation and income, this

correlation was moderate and negative, indicating that the greater the county percent earning *only* a high school diploma, the lower the median household income (r = -.493*** and r = -.474***, respectively). On the other hand, the three higher degrees of educational attainment were positively and weakly to strongly associated with median household income. The greater the county percent completing higher degrees of education, the greater the county's median household income. In both bivariate tables, this correlation was strongest at the bachelor's degree level and weakest at the associate's degree level.

In both data sets, county rurality was positively and strongly correlated with county-level high school graduation while it was negatively and moderately to strongly correlated with county-level attainments of bachelor's and graduate/PhD degrees. As county rurality increased in Tables 2 and 3, likely too were county percentages of high school graduation (r = .564*** and r = .506***, respectively). Meanwhile, the more rural the county, the fewer the percentage of county residents completing bachelor's and graduate/PhD degrees.

In Table 2, residential segregation was moderately and negatively correlated with county rurality (r = -.233***). The more rural the county, the lower it scored on the residential segregation index. In Table 3, white residential segregation (or the percentage of white residents per county) was positively correlated with all three non-educational variables. The correlation between white segregation and median age was weak, indicating that on average, whiter counties were more likely to be populated with older residents (r = .130***). Likewise, white racial segregation was weakly correlated with median household income, so counties with higher median household incomes were more likely to be predominantly white (r = .122***). Finally, white residential segregation was moderately associated with county rurality (r = .302***). The more rural the county, the more likely it was to be predominantly white.

Education levels were highly correlated with one another, which reveals the structured progression of educational attainment. The county percent high school graduation variable revealed the percentage of county residents earning *only* a high school diploma. As such, a county's graduate/PhD degree percent levels were strongly correlated with the percentage of residents per county who earned prior degrees. Of greatest concern in Tables 2 and 3 were the very strong relationships between the percent of the county completing bachelor's degrees and median household income (r = .724*** and r = .701***, respectively). This relationship suggested evidence of multicollinearity, so the multivariate regression analysis assesses only high school/GED and graduate/PhD degree measures of educational attainment.

The four-model regression R^2 results (see Table 4) showed that in each model, just over 40 percent of the variance in educational attainment was explained by the combined effects of each segregation measure and the control variables. Every regression equation was significant at the $p < .001$ level. In Model 1 ($F = 480.367$, $p < .001$), there were significant relationships between county-level high school graduation and residential segregation (b = .048***), median household income (b = -1.785***) and percent rural (b = .109***). Therefore, after controlling for all other independent variables, a $10,000 increase in median household income yielded an approximate 1.79 percent decrease in county high school graduation. For every point more on the dissimilarity index or every one percent rural increase, county high school graduation increased by .05 percent or .11 percent, respectively. In Model 2 ($F = 539.530$, $p < .001$), there were significant relationships between county-level high school graduation and percent white (b = .103***), median household income (b = -2.408***) and percent rural (b = .061***). In this model, a $10,000 increase in median household income yielded an approximate 2.41 percent decrease in county high school graduation after controlling for all other variables. For every

additional percent increase in county whiteness or rurality, county high school graduation increased by .10 percent or .06 percent, respectively. The strongest predictors of high school graduation in Models 1 and 2 were rurality (β = .458***) and median household income (β = -.412***), respectively.

TABLE 4 ABOUT HERE

In Model 3 (F = 577.052, p < .001), there were significant relationships between county percent graduate/PhD degree completion and residential segregation (b = .017***), median household income (b = 1.600***), and percent rural (b = -.042***). Therefore, after controlling for all other independent variables, a $10,000 increase in median household income yielded an approximate 1.60 percent increase in county percent graduate/PhD degree completion. For every additional point on the dissimilarity index or one percent rural increase, county graduate/PhD degree completion increased by .02 percent or decreased by .04 percent, respectively. In Model 4 (F = 559.976, p < .001), there were significant relationships between county percent graduate/PhD degree completion and median household income (b = 1.482***) as well as percent rural (b = -.045***). This model revealed that after controlling for all other variables, a $10,000 increase in median household income yielded an approximate 1.48 percent increase in county graduate/PhD degree completion. Meanwhile, for every one percent increase in county rurality, graduate/PhD degree completion decreased by .05 percent. The strongest predictor of graduate/PhD degree completion in Models 3 and 4 was median household income (β = .471*** and β = .436***, respectively).

When comparing the standardized coefficients of each variable across the four regression models, residential segregation and percent white had the strongest effects in Models 1 and 2, respectively. Median household income had the strongest effect in Model 3, while percent rural

had the strongest effect in Model 1. Overall, median household income and percent rural were consistently the strongest predictors of educational attainment in every model, except for Model 2, for which percent white was the second strongest predictor (β = .289***). Broadly speaking, the four-model regression analysis supported my two hypotheses; however, it also introduced meaningful, alternate explanations for educational attainment at the county level.

DISCUSSION

In Tables 2 and 3, racial segregation was only correlated with county percent completion of graduate/PhD degrees, while percent white was only correlated with high school graduation. In the multivariate results, both correlations were maintained with the addition of the relationship between residential segregation and high school graduation. Therefore, both of my hypotheses were supported because residential segregation and county percent white shared positive, statistically significant relationships with educational attainment at the high school and graduate/PhD degree levels. In other words, the more racially homogenous the county, the greater the percent completing high school and earning graduate/PhD degrees. Similarly, the whiter the county, the greater the county percentage of high school graduation. While these results partially support Massey and Denton's (1993) theory of racial segregation and poor neighborhood formation, this study revealed that residential segregation does not completely explain the multiple layers impacting average educational attainment at the county level.

More so than either variable operationalized to measure racial segregation, median household income and percent rural were consistently the variables most strongly related to educational attainment in both the four regression models and two correlation matrices. Since income and rurality were treated as potential indicators of a county's "social isolation," their strong and consistent correlations with educational attainment in the bivariate and multivariate

results provide support for Wilson's (1987) theory of social isolation as they indicate a county's physical isolation, access to social networks, funding for institutional resources and presence of employed, positive role models (Ainsworth 2002; Owens 2010; Wodtke et al. 2011).

Counties that are more rural are more likely to have lower median household incomes (see Tables 2 and 3), a pattern that intuitively links physical isolation with a geographical concentration of poverty. Their physical isolation further distances these counties from accessing institutional resources that would otherwise promote educational and social mobility because rural counties are proximally farther away from these resources and rarely have established public transportation systems to access them. Meanwhile, counties with lower median household incomes have fewer funds to contribute to public taxes and building projects, a condition that limits the quality *and* quantity of institutional resources necessary for greater educational attainment and social networking. On the other hand, research on the topic of socioeconomic neighborhood effects highlights how financially privileged neighborhoods tend to cluster and concentrate wealth (Owens 2010). As such, counties with higher median household incomes are likely to be linked geographically or socially to counties with similar social class statuses (Mayor 2002). Although residential segregation is related to educational attainment, its effect is outweighed by other measures of social isolation, namely median household income and rurality.

CONCLUSION

The aim of this study was to examine the role of residential segregation on educational attainment outcomes at the county level. Using two data sets of 3,141 counties, I hypothesized that the more racially homogenous the county, the greater the average educational attainment. Furthermore, I predicted that as the county percent white increased, so too would the average educational attainment. Multivariate correlation results showed that there were significant

relationships between racial residential segregation and educational attainment at the high school/GED and graduate/PhD degree levels. County percent white (or white residential segregation) was significantly correlated with high school graduation. These findings support my two hypotheses overall; however, they were outweighed by the significant relationships between educational attainment and median household income or rurality. These data suggest that county rurality and median household income are the strongest predictors of educational attainment, so counties with lower median household incomes and greater rurality are the most ideal targets for new policy initiatives intended to remedy county-level disparities in higher education attainment.

These findings therefore support Wilson's theory of social isolation more than Massey and Denton's theory of racial segregation and poor neighborhood formation, even though they offer evidence in support of both. While race and socioeconomic status are typically related, median household income had the strongest effect on county-level educational attainment across the greatest number of models, even after controlling for residential segregation, median age and rurality (Charles 2003; Quillian 2014; Roscigno 1998). Within prior literature, these findings would most directly affirm research pointing to socioeconomic "neighborhood effects" as the strongest predictors of academic success and by extension, social mobility. They further demonstrate a need for policymakers to address county-level household income disparities before focusing on racial residential segregation (or integration). While policymakers cannot redistribute wealth easily, they *can* increase federal funding for schools in counties with lower median household incomes. Such funding can assist in compensating for the social isolation and resource deprivation effects in these counties.

Limitations

While this study was one of many that examined the impact of racial residential segregation on educational attainment, it was not without limitations. In particular, county-level data did not account for individual variation, so they offer only broad, average estimations of the impacts of residential segregation on educational attainment. The study results are not generalizable to individual people because doing so would commit the ecological fallacy. Secondly, these data only provide a temporal, cross-sectional explanation for educational outcomes (2011-2016); therefore, a study of greater length or a cross-comparison of multiple time periods might reveal more about the factors driving educational outcomes.

In addition, the variables themselves may not have clearly nor completely offered explanations for educational attainment. For example, the educational attainment variables did not discern whether they accounted for degrees obtained online, which might otherwise make higher education more accessible regardless of rurality or socioeconomic status because online degrees require little to no physical access to campus or extraneous fees for room and board. The achievement of online degrees might have been accounted for in the "middle" degrees of educational attainment; however, these variables at the associate's and bachelor's degree levels were excluded due to their resulting multicollinearity. Moreover, the selected education variables did not specify whether they encompassed less "traditional" institutions or forms of education, including vocational or technical schools, homeschooling or schools that do not confer degrees.

Nevertheless, more control variables could have been examined since the ones studied only accounted for less than half of the variance in educational attainment. Although my data sets did not lend themselves easily to testing other variables, existing empirical studies suggest controlling for school enrollment status (part-time or full-time), type of educational institution

(public or private), region of the country, access to public transportation, presence of afterschool care, population size, parental education, family size, parents' immigrant status and language background (Goldsmith 2009; Quillian 2014; Swisher et al. 2013).

Future Implications

Residential segregation is complicated to conceptualize and analyze in empirical studies, yet it is still important to further unpack because it is related, to some degree, to educational attainment outcomes. These findings complicate the Brown v. Board of Education case that declared the "need" for students of color to be integrated into white schools (Mallory 2017). Given the observed, positive relationships between residential segregation and educational attainment, future research might explore the potential *benefits* of racial segregation on educational outcomes in *both* racialized directions: white racial segregation and "ethnic" or "immigrant" enclaves (Portes and Rumbaut 1996; Quillian 2014). These benefits might also be explored where they converge or diverge between *residential* segregation and *school* segregation. One major area for further research is investigating the relationship between residential segregation and educational attainment on multiple scales of analysis, including but not limited to state-level data and the individual level, both of which might yield different policy implications. Furthermore, analyzing a measure of urbanity would have more directly accounted for the disproportionate, concentrated populations of color living in urban or metropolitan areas (Gordon and Monastirotis 2006; Johnson and Shapiro 2003; Wilson 1987). Beyond these suggestions, further research should assess the degree to which educational attainment can be explained by the intersectionality of the multiple dimensions of "neighborhood effects."

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Table 1: Means and Standard Deviations for All Variables

Variable	Mean	Median	SD	N
Racial Residential Segregation	31.32	33.00	13.197	2,780
Percent White (%)	77.09	84.50	19.898	3,140
HS Diploma (%)	34.60	35.00	7.130	2,780
Associate's Degree (%)	8.24	8.10	2.382	2,780
Bachelor's Degree (%)	13.32	12.20	5.549	2,780
Graduate/PhD Degree (%)	7.29	6.00	4.216	2,780
Rural (%)	54.18	54.63	29.969	2,780
Median Age	40.81	40.90	5.164	2,780
Median Household Income Per County ($)	47,175.19	45,154.50	12,413.490	2,780

Table 2. Correlations (*r*) between Educational Attainment and Four Variables (listwise deletion, two-tailed test, *n* = 2,776)

Variable	Associate's Degree	Bachelor's Degree	Graduate/PhD Degree	Racial Segregation	Median Age	Household Income	Percent Rural
HS/GED	-.185***	-.762***	-.698***	-.027	.023	-.493***	.564***
Associate's Degree		.194***	.017	.105***	.102***	.241***	-.081
Bachelor's Degree			.812***	.090***	.036	.724***	-.535***
Graduate/PhD Degree				.137***	.036	.594***	-.501***
Racial Segregation					.028	.029	-.233***
Median Age						.029	.016
Household Income							-.404***

***$p < .001$

Table 3. Correlations (*r*) between Educational Attainment and Four Variables (listwise deletion, two-tailed test, *n* = 3,134)

Variable	Associate's Degree	Bachelor's Degree	Graduate/PhD Degree	Percent White	Median Age	Household Income	Percent Rural
HS/GED	-.152***	-.741***	-.676***	.321***	.033	-.474***	.506***
Associate's Degree		.189***	-.010	.338***	.105***	.235***	-.014
Bachelor's Degree			.774***	.043	.028	.701***	-.447***
Graduate/PhD Degree				-.036	.016	.562***	-.498***
Percent White					.130***	.122***	.302***
Median Age						.026	.025
Household Income							-.359***

***$p < .001$

Table 4. Four-Model Regression of County-Level Educational Attainment on All Variables

	High School/GED		Graduate/PhD	
Variable	Model 1	Model 2	Model 3	Model 4
Residential Segregation	.048***	--	.017***	--
	(.088)	--	(.053)	--
Percent White	--	.103***	--	.003
	--	(.289)	--	(.013)
Median Age	.031	-.001	.020	.009
	(.022)	(.000)	(.025)	(.012)
Median Household Income	-1.785***	-2.408***	1.600***	1.482***
(per $10,000)	(-.311)	(-.412)	(.471)	(.436)
Percent Rural	.109***	.061***	-.042***	-.045***
	(.458)	(.270)	(-.299)	(-.345)
Constant	34.360	34.588	.655	2.125
N	2,776	3,134	2,776	3,134
R^2	.409	.438	.425	.417
df	(4,2771)	(4,3129)	(4,2771)	(4,3129)
F	480.367***	539.530***	577.052***	559.976***

***$p < .001$; standardized coefficients in parentheses

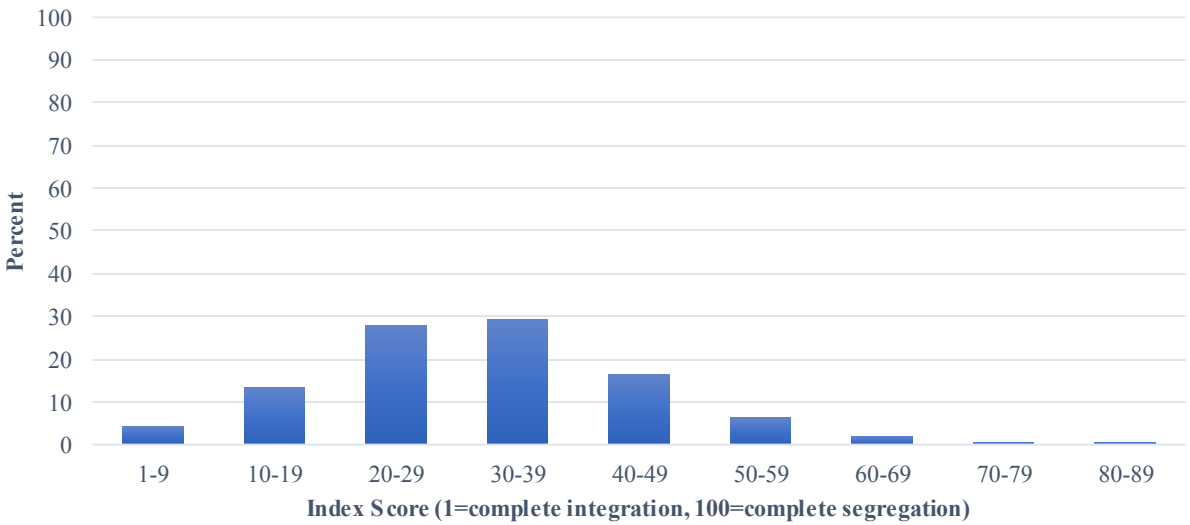

Figure 1. Racial Residential Segregation Index of Dissimilarity

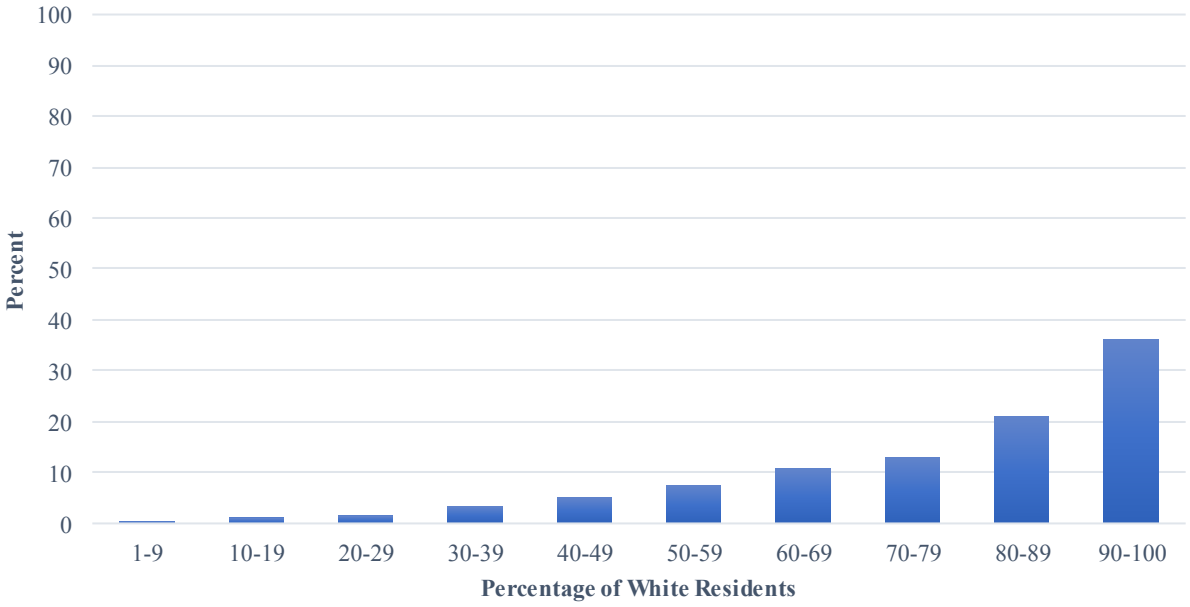

Figure 2. Percentage of White Residents per County

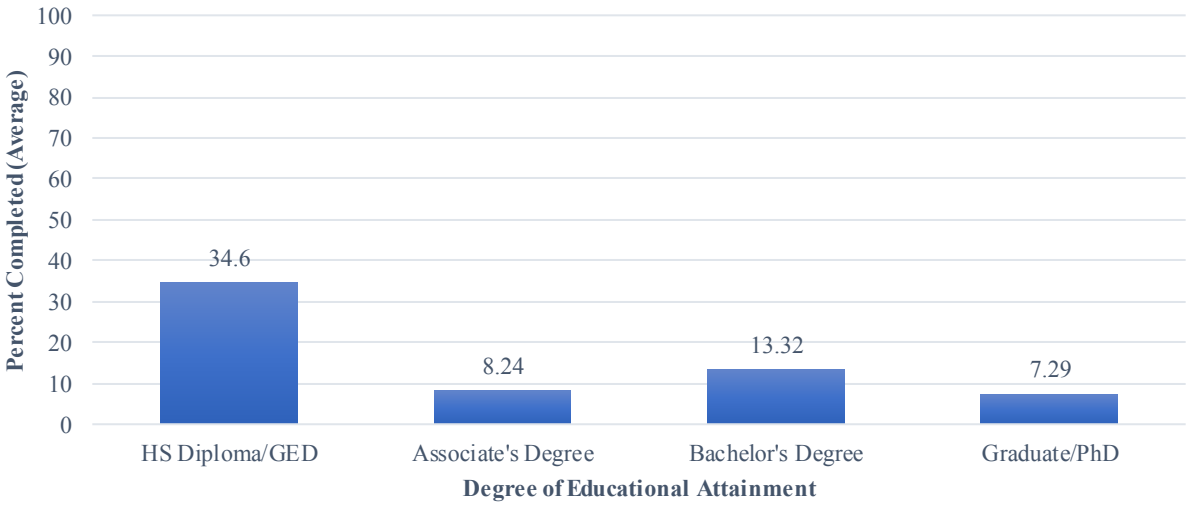

Figure 3. Average Percentage of County Completing Ascending Degrees of Education

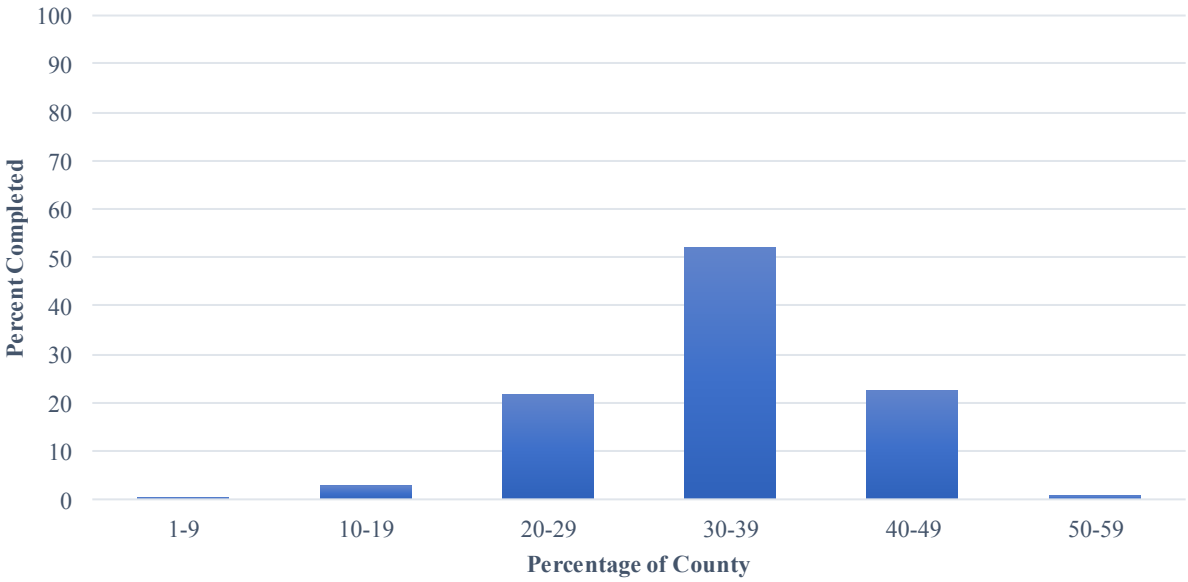

Figure 4. Percentage of County Completing High School

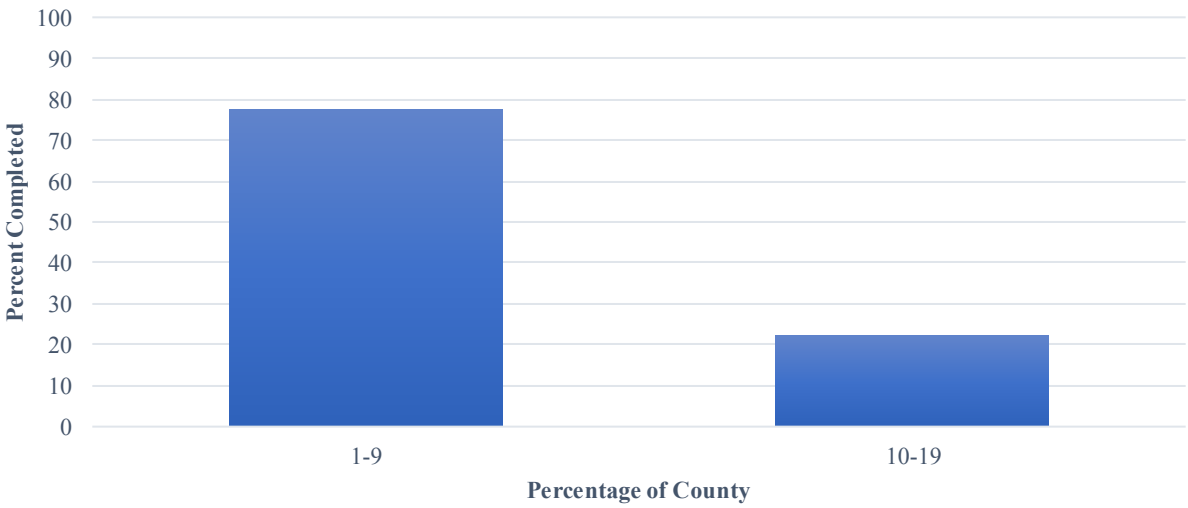

Figure 5. Percentage of County Completing Associate's Degree

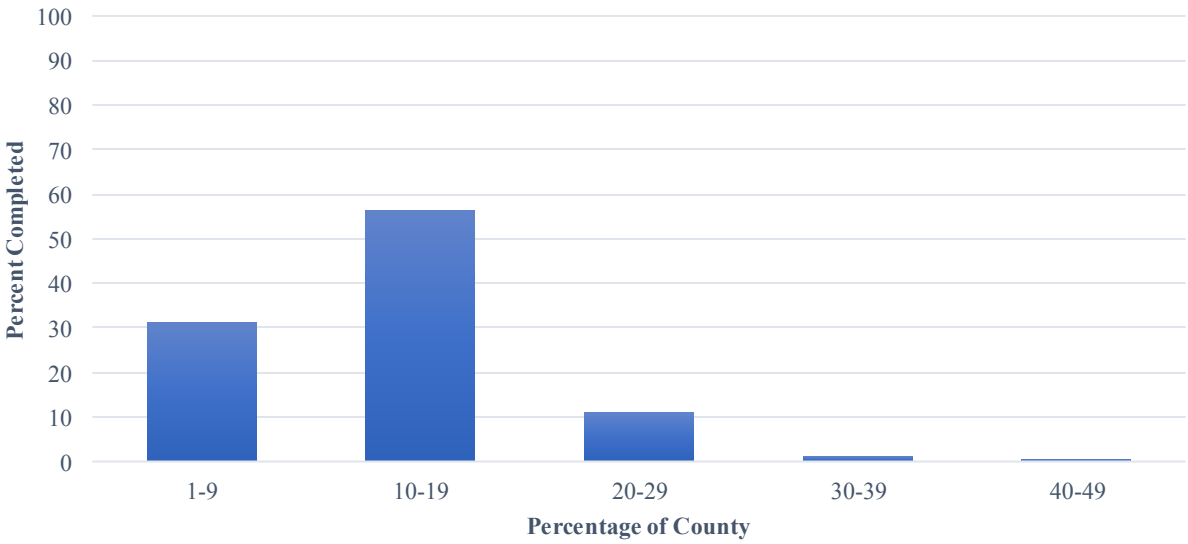

Figure 6. Percentage of County Completing Bachelor's Degree

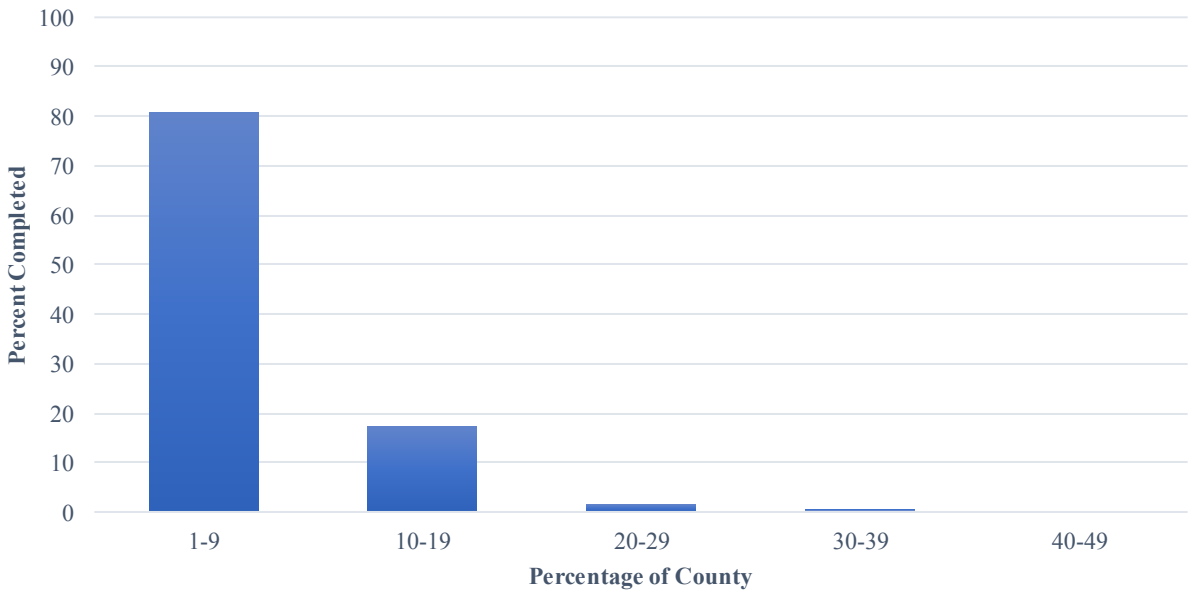

Figure 7. Percentage of County Completing Graduate or PhD Degree

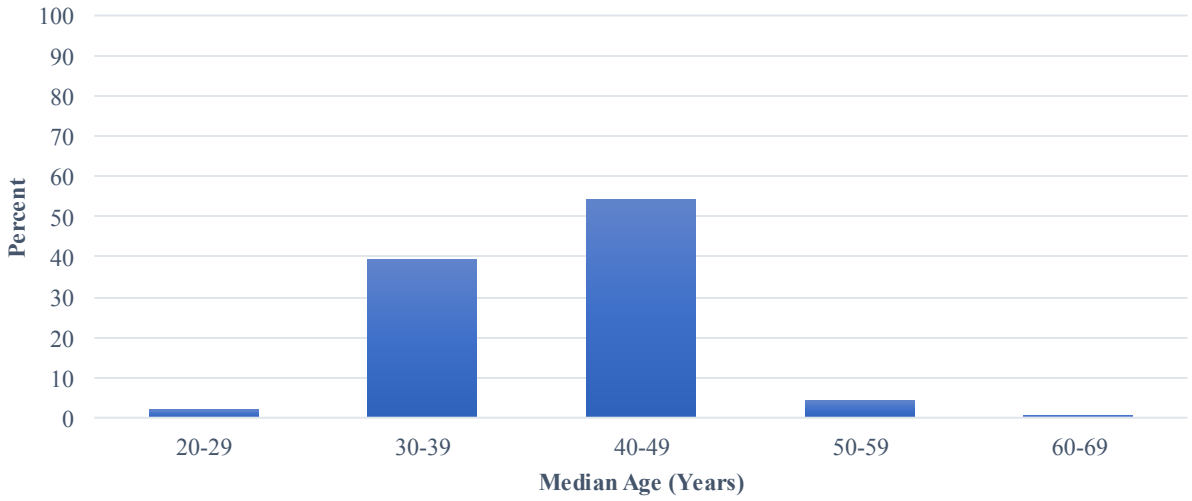

Figure 8. Median Age per County

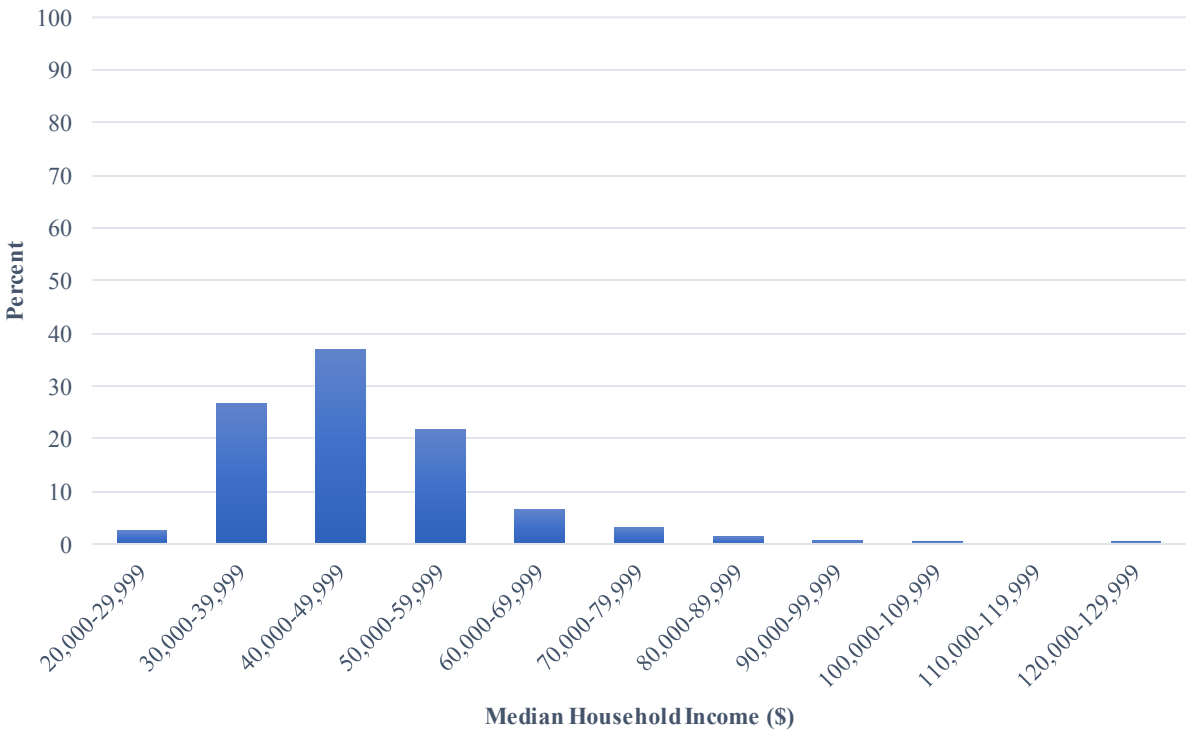

Figure 9. Median Household Income per County

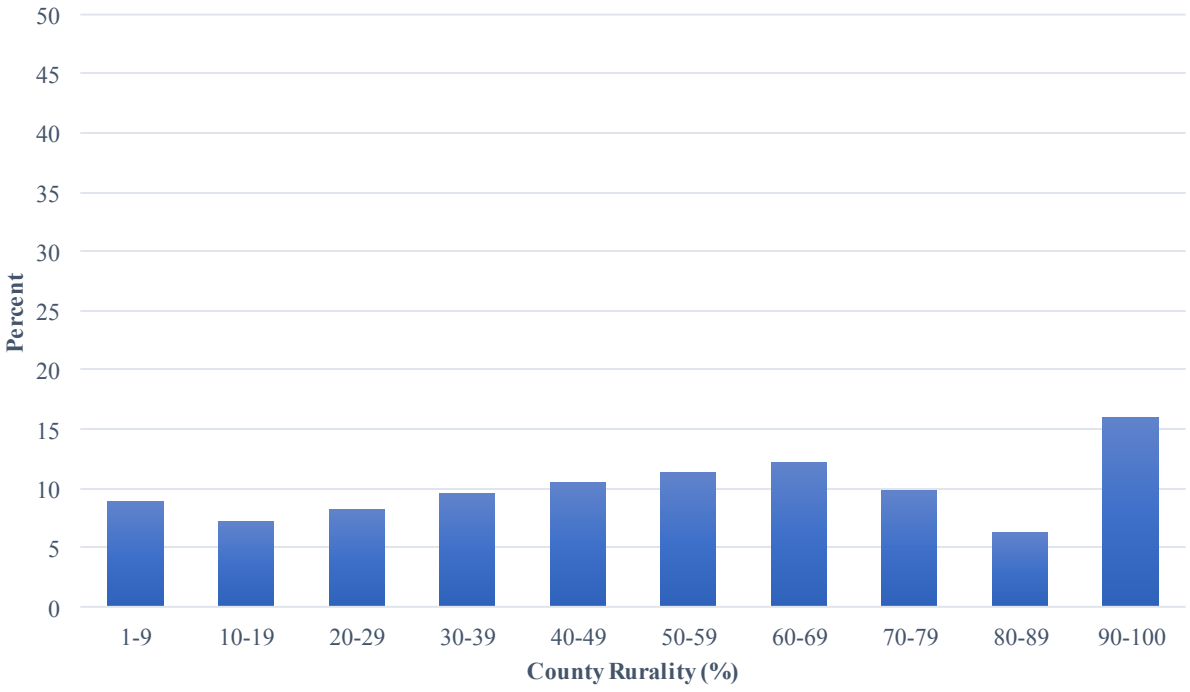

Figure 10. Percentage of County Living in a Rural Area